IN THE CLAIMS

1. (Original) A method of recognizing objects under various lighting conditions comprising the steps of:

(a) providing a database comprising a plurality of three dimensional models;

(b) providing an input image;

(c) positioning each three dimensional model relative to the input image;

(d) determining, for each three dimensional model, an optimal rendered image which is most similar to the input image, said determining step comprising:

(i) deriving a reflectance function that describes an approximation of the set of all possible rendered images that each three dimensional model can produce under all possible lighting conditions, wherein said reflectance function analytically excludes illumination within cast shadows on said model; and

(ii) optimizing the reflectance function to determine an optimal rendered image of each model that is most similar to the input image;

(e) computing a measure of similarity between the input image and each optimal rendered image; and

(f) selecting the three dimensional model corresponding to the optimal rendered image whose measure of similarity is most similar to the input image.

2. (Original) The method according to Claim 1 wherein the reflectance function includes a local horizon for each point on each said model, wherein no light originating below said local horizon contributes to the reflectance from said point.

3. (Currently Amended) The method according to Claim 2 wherein said local horizon is defined by the polar angle of said local ~~horizion~~horizon in any direction.

4. (Original) The method according to Claim 2 wherein said local horizon is variable with the azimuth at each point on said model.

5. (Withdrawn) A method of deriving a reflectance function of an object model under a variety of lighting conditions, the object model comprising a plurality of surfaces, each of the surfaces defining a normal vector pointing perpendicularly outward, the method comprising the steps of:

(a) determining a local horizon for each point on said object model, wherein no light originating from below said local horizon is incident at said point;

(b) rendering, for a given orientation of the object model, a plurality of images produced by the object model when illuminated by each of a plurality of spherical harmonic components of incident light, wherein said rendering comprises:

(i) calculating the intensity of incident light components upon the object model, relative to the normal at each surface, excluding light originating from below a local horizon at any point on said model; and

(ii) calculating the intensity of light components reflected by the model toward the observer; and

(c) defining a reflectance function for the object as a linear combination of said plurality of images.

6. (Withdrawn) The method according to claim 5, wherein said plurality of images comprises the images produced by the 0th, 1st, and 2nd order spherical harmonic components of incident light.

7. (Withdrawn) The method according to claim 5, wherein the step of determining the local horizon for each point on said object model comprises determining the local horizon as a function of the polar angle of the local horizon at each said point.

8. (Withdrawn) The method according to claim 7, wherein the function measured by the polar angle is dependent on the azimuth.

9. (New) A method of image recognition of an input image, the method comprising:

(a) receiving a three-dimensional model of a candidate object in a particular orientation;

(b) generating a set of harmonic images for the three-dimensional model, the harmonic images forming the basis for a linear subspace, and approximating the reflectance on the candidate object when illuminated by a harmonic light, said reflectance analytically excludes illumination within cast shadows on said three-dimensional model; and

(c) selecting a candidate image from the set of harmonic images, the candidate image representing a point in the linear subspace that is nearest to the input image, by seeking a vector of harmonic coefficients that minimizes the difference between the input image and the candidate image.

10. (New) The method according to claim 9, wherein the candidate image is restricted to a subset of harmonic images that corresponds to physically realizable lighting conditions.

11. (New) The method according to claim 9, wherein the linear subspace comprises the first four harmonic images.

12. (New) The method according to claim 9, wherein the linear subspace comprises the first nine harmonic images.

13. (New) The method according to claim 9, wherein the linear subspace comprises the first eighteen harmonic images.

14. (New) The method according to claim 9, wherein the harmonic light comprises spherical harmonic light.

15. (New) The method according to claim 9, wherein analytically excluding illumination within cast shadows on said three-dimensional model comprises excluding those components of a harmonic light originating below a local horizon at each point of the three-dimensional model.

16. (New) The method according to claim 15, wherein the local horizon is presumed to be constant around a line of azimuth.

17. (New) The method according to claim 16, wherein the line of azimuth is collinear with a local surface normal.

18. (New) The method according to claim 16, wherein the line of azimuth forms an angle with a local surface normal.

19. (New) The method according to claim 16, wherein approximating the reflectance on the candidate object when illuminated by a harmonic light further comprises approximating a general solution for some subset of points on the surface of the three-dimensional model that are within a common mutual horizon.